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VOLUMETRIC ASSESSMENT OF CORONARY CALCIFICATION USING OPTICAL COHERENCE TOMOGRAPHY

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Background: Calcified plaques (CP) present unique challenges for percutaneous coronary intervention. We sought to quantify calcium volume in coronary atherosclerotic plaques by means of intravascular optical coherence tomography (OCT).

Methods: Thirty cadaveric coronary arteries were imaged using Frequency-Domain OCT. Vessels were frozen, automatically sectioned and imaged at 20μm intervals using an in-house built cryo-imaging system. Volumetric co-registration between OCT and cryo-images was performed. CP area, distance from lumen and angle were traced (fig 1) and total volume was calculated.

Results: Quantification was performed in 257 OCT and 1285 co-registered cryo-images (19 matched CP). Interpolation was required to trace deep calcification boundaries in 7 cases. Overall there was good agreement for measurement of luminal depth of calcium (0.25±0.09 vs. 0.26±0.12mm), circumferential distribution of calcification (35.33±21.86 vs. 39.68±26.61°), and calcium volume (1.42±1.86 vs. 1.99±2.87mm3) for OCT and cryo-imaging respectively. There was good correlation between OCT and cryo for the previously mentioned parameters: R=0.90, 0.88, and 0.76, respectively ($p<0.01$). OCT underestimated calcium volume (3.11±2.14 vs. 4.58±3.39mm3, $p<0.01$) in the 7 cases with deep calcifications as compared to cryo.

Conclusions: Intravascular OCT can accurately quantify the luminal depth, calcium volume and circumferential distribution of coronary plaque calcifications in humans.